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EXAMINATION OF STATISTICS AND REVIEW OF THE CURRENT MARKET SITUATION AND OUTLOOK

Recent developments and short-term outlook in the tungsten market

Report by the UNCTAD secretariat

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SUMMARY AND CONCLUSIONS

1. The tungsten market has been seriously affected by the downturn in demand as a result of the economic recession which has recently affected major world economies and hit hard some of the industries which are major consumers of tungsten, including mining, steel-making, automotive, machine tool, aerospace and construction. Estimates for 1991 put world consumption of ores and concentrates at 37,249 metric tons, down by 11.8 per cent, further to a decrease of the same magnitude in 1990. The successive decreases of consumption have reduced demand for tungsten ores and concentrates to its lowest level since 1982-1983, although the weak market situation then was due to factors quite different from those currently prevailing.

2. In developed market-economy countries, consumption of ores and concentrates fell to 10,409 metric tons, down by 7.8 per cent, and would have fallen even more had imports of intermediate products from developing producing countries not been substantially cut back. The in-roads made by the latter materials in the market, at the expense of consumption of ores and concentrates, seem to have considerably subsided in some consuming countries following the rapid growth of recent years. However, it is unlikely that consumption of ores and concentrates in the developed market-economy countries could significantly regain the ground lost to imported intermediate products.

3. In the former USSR and other eastern European countries, which accounted not so long ago for as much as about 40 per cent of world consumption of tungsten, demand for tungsten has recently fallen sharply because of the economic downturn in key industrial sectors. Consumption of ores and concentrates for 1991 in these countries was estimated at 8,700 metric tons compared to 12,500 metric tons in 1990. As regards China, estimates of its consumption of ores and concentrates for 1991 have been maintained at the previous year's level of around 15,000 metric tons.

4. Total world mine production was estimated at 35,926 metric tons, down by 16.5 per cent compared to 1990, which is the third consecutive fall in mine production since 1988 when it was estimated at 50,582 metric tons. The cutbacks occurred mainly in the developed market economy countries (32.7 per cent), China (20 per cent) and the former USSR (14.3 per cent). Following successive decreases since 1984, production showed some recovery in the developing countries, mainly in Latin America. Total mine production of developing countries remained, however, relatively small: estimated at 4,894 metric tons in 1991 compared to 3,948 metric tons in 1990.

5. Despite the cutbacks in mine production, there are still substantial amounts of material held in commercial stocks (producers', consumers' and dealers' stocks). There was a decrease in "involuntary" stocks held by producers but it seemed to have been partly compensated by increases in consumers' stocks. According to available data, commercial

stocks decreased by 5.9 per cent. As regards the United States of America's strategic stockpile, although no release of material has been made recently, there has been major concern in the market following the announcement by the United States Department of Defence to recommend deep cuts in the stockpile of the Defence Logistic Agency (DLA) (nearly 10,000 metric tons) although so far no disposal plan has been fixed.

6. Notwithstanding the downturn in demand, tungsten prices have shown some improvements largely attributable to the ban imposed by China on its exports of wolframite. Although the ban was lifted in mid-1991, tungsten prices did not collapse. China's exports of ores and concentrates amounted to only 42 metric tons for the first quarter in 1992, compared to 1,448 metric tons over the same period in 1991. On the basis of *Metal Bulletin* quotations, wolframite prices averaged $US 57 per m.t.u. in 1991 compared to $US 46 per m.t.u. in 1990, although scheelite prices were slightly lower, averaging $US 62 per m.t.u. in 1991 as against $US 63 per m.t.u. in 1990. The price situation gained further strength as the market entered 1992, with concentrate prices averaging $US 66 per m.t.u., which was not the case in many other mineral metal markets. However, the market suffered some setbacks following the announcement by the United States Defence Department to recommend stockpile cutbacks. Concentrates were trading between $US 55 and $US 64 per m.t.u. at the time of writing.

7. As regards intermediate products, ammonium paratungstate was traded at an average of $US 72 per m.t.u. in the United States and $US 63 per mt.u. in western Europe in 1991 compared to $US 66 per m.t.u. and $US 59 per m.t.u. respectively in 1990. The differentials between APT prices in the United States and western European markets have considerably widened, owing largely to different policy measures adopted in these two markets regarding trade in tungsten materials. The weak demand in the steel industry coupled with an oversupply situation saw further deterioration in the ferro-tungsten market. Ferro-tungsten prices which averaged $US 6.25 per kg at the beginning of 1991, fell for most of the year to reach $US 5.60 by the end of it. The decline was further accentuated in 1992, with prices quoted at between $US 5.00 and $US 5.15 per kg at the time of writing.

8. At current levels, tungsten prices are still relatively low. With low tungsten prices and a still largely oversupplied market, tungsten mining remains characterised in many producing countries by a low rate of capacity utilization, closed-down mines and the abandonment or postponement of most investment projects. Of the world mine capacities, China accounts for the largest tonnage, currently estimated at 30,000 metric tons which represents over half of the world total. It accounted for only 15,000 metric tons of capacity a decade ago, when its tungsten industry was relatively underdeveloped in relation to its huge ore reserves. The ratio of China's mine capacity to ore reserves has currently reached a level close to the world average, which could suggest the possibility of slower mining development in its tungsten sector in the future.

9. Trade in tungsten ores and concentrates measured by export shipments fell by 24.7 per cent in 1991, due mainly to the ban imposed by China in the face of deteriorating market conditions (see paragraph 6). While China sharply reduced its exports of concentrates, the level of its exports of intermediate products remained at a level similar to that of the previous year (estimated at between 11,000 and 12,000 metric tons). In the meantime, the world market for tungsten ores and concentrates had sunk to an amount only one-sixth of its size in value terms compared to the beginning of the 1980s.

10. With respect to the short-term outlook in the market, recent forecasts predict a slow recovery in the major world economies. However, many of the tungsten-consuming industries, including mining, construction and capital goods are still in the doldrums. According to this perspective, demand for tungsten should stay weak for some time before a recovery could be expected. Even in the event of stronger demand, market prospects would also depend on supply. In past years, the tungsten market has mostly faced an oversupply situation. Recent efforts to streamline supply have contributed to strengthening the market; however, it still looks precarious, particularly in view of the fact that efforts to streamline supply have been limited to shipments of concentrates and that substantial amounts of DLA material could be released if the Pentagon recommendation as recently reported were adopted.

Chapter II

DEVELOPMENTS IN DEMAND AND SUPPLY IN THE TUNGSTEN MARKET

A. An overview of the world economic situation

11. Like most minerals and metals, market conditions for tungsten have been strongly influenced by the recent economic slowdown which has affected major world economies. Following successive years of relatively strong performance since 1984, the world economic growth rate began to weaken, reaching a negative rate of 0.3 per cent in 1991, compared to positive rates of 2.4 per cent in 1990 and 3.3. per cent in 1989 (see annex I). Although there have been some signs of recovery more recently, economic weakness has been lingered in major world economies. A recent World Bank forecast puts the world economic growth rate at 1.4 per cent for 1992, indicating low economic prospects ahead, at least for the immediate future.

12. The impact of the world economic slowdown has varied greatly from country to country. In the case of the former USSR, its economic growth dropped sharply in 1991 to a negative rate of 17.0 per cent subsequent to a decrease of 4.0 per cent in 1990 and growth of only 2.4 per cent in 1989. The economy of this sub-region is forecast to contract further by 17.0 per cent in 1992. Among the developed market-economy countries, Canada, Sweden, United States of America and the United Kingdom have suffered from slow growth rates, but economic performance remained strong in Japan. Following national unification, Germany managed to achieve a positive growth rate although sharply lower than the 4.5 per cent recorded in 1990 and 4.3 per cent in 1989; a higher growth rate is expected in 1992. Like other major economies, France has also been affected by the recent economic recession but it has managed to attain a growth rate higher than the average of the developed market economy countries. Among developing countries, the Eastern and South-Eastern Asian countries, including the Republic of Korea and Thailand, as well as China, achieved substantially higher growth rates than most other developing countries. As the process of industrialization spreads in the developing countries, their influence on market conditions for minerals and metals, including tungsten, would grow as they become more significant consumers on the international market. In the case of tungsten this would include such products as drill bits, cutting tools or tungsten filaments for domestic or industrial lighting.

13. In addition to the weak economic backdrop (briefly described above), the excess supply situation has been compounded by other factors more specific to the tungsten market, including the restructuring of the world tungsten industry, the overhang of stock materials and idle mine capacities, the change in trade policies, and more recently the announcement by the United States Department of Defence to recommend substantial cutbacks in DLA stockpiles. These factors are no less important in determining recent developments in the tungsten market.

B. Tungsten consumption

1. Consumption of ores and concentrates

14. Mining, steel, metal-working, automotive, aerospace and construction, form the industries which are the major consumers of tungsten in one form or another. These industries are among the most seriously affected by the recent recession. The decreased demand for ores and concentrates has been influenced further in many countries by such external factors as shrinking export markets for their products, increased competition from imported intermediate materials and greater trade barriers faced by tungsten exports. Furthermore, the on-going process of economic restructuring in the former USSR and other eastern European countries, and the self-imposed supply adjustments in China have also affected the consumption of tungsten ores and concentrates.

15. In 1991, world consumption of tungsten was estimated at 37,249 metric tons, down by 11.8 per cent further to a decrease of the same size in 1990. The successive decreases brought consumption of tungsten ores and concentrates to below the level of 1982-1983, when the world economy had been similarly suffering from a major industrial recession. However, the market situation then was structurally different from what it is today. Earlier the drop in consumption occurred mainly in the developed market-economy countries while China consumed hardly more than a quarter of its current level of ores and concentrates and its economy had not yet been fully opened up to international trade as it is now.

16. In past years the closing down of processing capacities owing to the availability of imported intermediate products from China and the Republic of Korea has affected the consumption of ores and concentrates in virtually all developed market-economy countries. During the upturn in demand in 1987-1988, the latter consumption staged some recovery, albeit not sustained in the face of the approaching recession. The industry was furthermore awash in an abundant supply of imported intermediate products. Following sharp falls in 1990, the decline of consumption has recently levelled off. In 1991, consumption of ores and concentrates rose by 8.9 per cent in the United States, where tungsten consumption benefitted from demand generated in the period after the end of the Gulf war. However, it fell by 11.0 per cent in Austria, 46.6 per cent in Germany and 2.8 per cent Japan, where it continued to be affected by imported intermediate materials. With substantially reduced consumption in most of the other major consuming countries, the United States now accounts for more than half of the consumption of ores and concentrates in the developed market economy countries, attributable partly to the size of the United States' market and partly to the measures which limit imports of intermediate materials.

17. In the developing countries, consumption of tungsten ores and concentrates has remained small, oriented mostly to use in domestic industry, except in the Republic of

Korea. The latter country has developed an integrated industry, which converts most of its domestic-produced concentrates into intermediate products as well as upper-market products, including powder and carbide products with production remaining strongly export-oriented although an increasing amount is consumed domestically. With the exception of 1988, this country's consumption of tungsten ores and concentrates has been maintained at around 2,000 metric tons annually. Tonnages consumed in other developing countries are: 30 metric tons in Argentina; 400 metric tons in Brazil; and 200 metric tons in India. Produced mainly for the domestic markets, these tonnages do not vary substantially with the vicissitudes of the export market.

18. In the former USSR which used to be the largest consumer of tungsten in terms of ores and concentrates, consumption dropped sharply as a result of the ongoing economic transition. Consumption of ores and concentrates was recently estimated to be below 9,000 metric tons, compared to some 16,000 metric tons at the beginning of the 1980s. Major industries, such as armament, mining, oil and steel-making which account for the bulk of the gross national product, are reported to have substantially reduced output.[1] Likewise, consumption has been seriously affected in other eastern European countries, such as in the coal industry of Poland and the lamp industry of Hungary.[2] No consumption of ores and concentrates has been reported by Poland since 1989. In Hungary, estimates of consumption of ores and concentrates have been revised downward by half.

19. In China, in the wake of economic reform, efforts have been made both to expand and vertically diversify production in the tungsten sector, as in many other mineral and metal sectors, to meet both domestic and export needs. Consumption of tungsten ores and concentrates, less than 5,000 metric tons in 1980, had risen to an estimated 15,000 metric tons by the end of the decade. Additional processing units were established, particularly in

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[1] For example, production cutbacks had reduced oil production from 551.3 million metric tons in 1990 to 462.0 million metric tons in 1991 and further cutbacks were expected for 1992, with production falling to from 396 to 412 million metric tons, according to some forecasts; the armament industry, which accounted for 30 to 40 per cent of the gross national product, was reported to have received no new orders (See *Financial Times*, 28 October 1991, page 2, and 6 March 1992, page 6).

[2] The largest consumer of tungsten in Hungary is Tungsram which is a major light bulb company with a majority share owned by General Electric of the United States. The company was recently reported to have suffered large losses (*Financial Times*, 26 March 1992, page 10).

the major tungsten-producing provinces.[3] This has completely transformed the outlook of the tungsten industry in China. In 1980, China processed only 30 per cent of its ores and concentrates into up-market products; by 1990 the proportion had risen to more than 60 per cent. The measures taken by the Chinese authorities to ban exports of wolframite further enhanced the latter proportion which reached 80 per cent in 1991. It may further increase in 1992 as so far China has exported little concentrates in 1992. However, the larger part of downstream production still consists of intermediate products, principally ammonium paratungstate, tungsten oxide and sodium tungstate, although powder products as well as cutting tools, drill bits and rollers are reported to be also available for export. Estimates put consumption of Chinese ores and concentrates at 15,000 metric tons in 1991, in other words at around the level of 1990 following the large expansion of 1988-1989.

20. In the longer term, the expected industrial upturn in consuming countries and the relative low tungsten prices point to prospects for greater consumption of tungsten. Such prospects may not, however, spread out to benefit all countries equally.

2. Consumption of intermediate products

21. Perhaps the most fundamental recent developments in the tungsten industry have been those which have accompanied the shift of consumption to intermediate materials imported mainly from China and the Republic of Korea, instead of tungsten concentrates in major consuming countries. These developments have led to the closure of domestic mine capacities, often with loss of employment in geographical regions where alternative employment opportunities have been limited. The end of mining, in many cases, also meant the shut-down of plant capacities for converting ores into intermediate products. Increased consumption of imported materials has also provoked fears of excessive dependence on a world tungsten market which tends to look increasingly monopolistic.

22. The increased consumption of imported intermediate materials from developing producing countries at the expense of concentrates is, however, not without its advantages, which in most cases outweigh the disadvantages. Apart from the competitive availability of tungsten materials, the countries able to take advantage of the commercial opportunity offered by the increased supply of intermediate materials have been successful in expanding their output of up-market products, increasing the value added in their output, and reducing industrial pollution by importing cleaner materials. These countries would have paid a higher price for their tungsten material if they had had to depend on intermediate materials produced domestically from imported concentrates or materials imported from other developed market-economy countries. In many cases, including Belgium, Luxembourg, Italy,

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[3] The major tungsten-producing provinces are Hunan, Jiangxi, Guangtung and Guangxi.

Netherlands and Spain, the readily available imported intermediate materials enabled these countries to expand or rehabilitate their tungsten industry, which would have been difficult to achieve had they had to rely solely on imported or domestic tungsten concentrates. In this respect, consumption of imported intermediate materials has been gainful rather than detrimental to employment.

23. Total consumption of tungsten in the form of concentrates and imported intermediate products for selected importing countries is shown in annex III. According to this data, consumption of tungsten in developed market-economy countries appears to have been healthier than if measured solely in terms of ores and concentrates. The in-roads made by imported intermediate materials in the replacement of ores and concentrates began to gain significant speed from the mid-1980s, in the face of increased competition in a weak market. By the beginning of the 1990s, imported intermediate materials had accounted for more than half of total consumption. In 1991, consumption of concentrates and imported intermediate products (called primary consumption) in the selected countries amounted to 22,041 metric tons, down by 11.2 per cent, further to the decrease of 17.0 per cent in 1990. The falls in demand affected concentrates more strongly than imported intermediate products, as the concentrate market continued to shrink.

C. Supply of ores and concentrates

1. Mine production

24. Weak demand in a market environment of abundant availability of material has put further pressure on mine production which had already seriously shrunk in such countries as Australia, Canada, Republic of Korea, Thailand and the United States of America. The recent economic downturn not only reduced prospects for re-opening closed mines but also hit existing mine operations, leading to reduced output and further capacity closures, with the exception of some developing countries (particularly in Latin America and Thailand). In 1991, total mine production was estimated at 35,926, down by 16.5 per cent further to the decrease of 10.8 per cent in 1990. The successive decreases in the last decade reduced world production of tungsten ores and concentrates to its lowest level. The production level was even lower than in 1983 when demand was also seriously affected by continued recession in industry.

25. In the developed market-economy countries, mine production was estimated at 3,182 metric tons, down by 32.7 per cent, further to the decreases of 7.4 per cent in 1990 and 1.6 per cent in 1989. The decrease occurred mainly in Australia as a result of the closure of the King Island scheelite mine late in 1990. Both external factors and relatively high domestic

production costs[4] have wrought havoc with mine capacities, reducing the country to a marginal tungsten producer in relation to the size of Australian production in earlier years. In 1991, Australian production amounted to only 238 metric tons, compared to over 3,000 metric tons at the beginning of the 1980s. Among the developed market-economy countries, only Austria and Portugal still produce ores and concentrates in relatively significant amounts. However, mine production for 1991 was also down in these countries, by 6.7 per cent, to 1,400 metric tons, in Austria, and by 31.0 per cent, to 969 metric tons, in Portugal.

26. Mine production in the developing countries has been less affected by the world economic slowdown than elsewhere. Since anti-dumping duties against Chinese exports of tungsten ores and concentrates have been implemented, shipments from many of these countries, which are eligible for "most favoured nations" (MFN) treatment, have benefitted from orders emanating from the EEC countries and the United States. Instead of buying domestic ores and concentrates, consumers in the latter countries imported non-Chinese materials which were still available at competitive prices. Total mine production of developing countries was estimated at 4,894 metric tons in 1991, compared with 3,948 metric tons in 1990 with the increases occurring mainly in Bolivia (46.7 per cent), Peru (157 per cent) and Thailand (124 per cent). However, mining operations in the developing countries still remain largely depressed compared to earlier years.

27. Before the dissolution of the USSR, mine production there was estimated at between 9,000 and 10,000 metric tons of tungsten ores and concentrates, largely intended for domestic consumption, mainly in steel, metallurgy, mining and armament industries. Production was characterized by low productivity and inadequate infrastructure; many of the mine operations needed investment in new machinery and equipment if they were to survive in a more market-oriented economy. In the absence of a major export outlet, the falling domestic demand accompanying the on-going economic restructuring has seriously affected production of tungsten, like many other non-ferrous metals.[5] Recent production was estimated at between 6,000 and 7,000 metric tons but this volume could further decline before the situation show signs of greater stability.

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[4] Refer to "Outlook for Australian mining competitiveness", *Engineering and Mining Journal*, January 1991, pp 14-15.

[5] This part of the report is based partly on the speech by Mr. Weisser (Metallgesellschaft AG) delivered to the Capital Metals and Materials Forum sponsored by the United States Bureau of Mines, in Washington (see *American Metal Market*, 2 March 1992, page 17).

28. There have been major production cutbacks of ores and concentrates by China following the announcement by the Chinese authorities of their intention to exert greater control on tungsten exports and to rationalize the exploitation of tungsten resources. Mining licences were made more difficult to obtain; mines which had incurred heavy losses were closed down or forced to re-structure. Estimates of Chinese output have been reduced since 1988 when annual production was estimated to have reached a peak of 30,000 metric tons. The 1991 level of production was estimated to be about 20,000 metric tons, down from 25,000 metric tons in 1990.

2. Stock movements

29. The economic upturn of 1987-1988 saw a substantial drop in the level of commercial stocks of ores and concentrates (producers', consumers' and dealers' stocks), which had accumulated in the previous years as a result of oversupply in the market. However, the economic slowdown since 1989 has resulted in rising stock levels in several countries. Notwithstanding recent drawdowns, the market is currently still considered to be overstocked, a situation which continues to exert a substantial overhang effect on tungsten prices.

30. According to available statistics, commercial stocks were down to 5,650 metric tons in 1991 compared to 6,108 metric tons and 6,002 metric tons in 1989 and 1990, respectively. The drop in commercial stocks was principally due to the unloading of stock material held involuntarily by producers, part of which went as far back as 1986. Producers' stocks fell to 2,800 metric tons compared to 3,853 metric tons in 1990. The closure of the King Island scheelite mine led to a drop of 37.7 per cent in the producers' stock of Australia. The remaining large producers' stocks were held in Portugal and Thailand. In Portugal, stocks decreased by 76.4 per cent, while they increased by 9.5 per cent in Thailand, which seemed to be still encountering difficulties to find adequate market outlets.

31. The level of consumers' stocks of ores and concentrates has been seriously affected by the replacement of ores and concentrates by imported intermediate products in consuming countries. The only two consuming countries still reporting substantial consumers' stocks are Japan and the United States of America. In 1991, the former country reported consumers' stocks of 661 metric tons, 23.1 per cent below the level reported for 1990, while in the latter country such stocks rose by 65.1 per cent, to 1,778 metric tons, largely due to the purchases made in anticipation of the anti-dumping duty of 151 per cent *ad valorem* which was eventually imposed on Chinese material in September 1991.

32. With the exception of Japan, Peru and Thailand, few other countries report their dealers' stocks although such stocks are known to be held in warehouses in a number of

cases. In 1991, reported dealers' stocks were nil in Argentina and Japan, 27 metric tons in Peru and 83 metric tons in Thailand.

33. As regards stocks of intermediate products, the only figures available are those published by the United States Bureau of Mines. The end-of-year total of producers' and consumers' stocks of ammonium paratungstate in the United States amounted to 578 metric tons in 1991 compared to 896 metric tons in 1990 and 915 metric tons in 1989.

34. No movement has been reported with regard to the United States stockpile. The total defence inventory of tungsten ores and concentrates has stood at 34,634 metric tons since the end of 1989. But the situation could substantially change as there have recently been reports that the United States Department of Defence could be seeking stockpile cutbacks.[6] This would amount to a complete policy reversal as far as tungsten is concerned. Hitherto, it was generally believed that the size of the tungsten stockpile was adequate for the defence requirements of the United States following the revision of stockpile targets in June 1990.[7] The latest reports concerning the Defence Logistic Agency (DLA) stockpile has taken the market by surprise, particularly by the size of cutbacks recommended by the United States Department of Defence, amounting to some 22 million pounds (9,979 metric tons). While according to an official source no disposal plan had been made for either the financial years 1992 or 1993,[8] at the time of writing, the rumours alone were sufficient to lower tungsten prices in the market almost immediately.

D. Developments in mine capacity

35. With low tungsten prices and an over-supplied market, the tungsten industry has recently been characterized by a low rate of capacity utilization. Globally, actual production in 1991 had represented only 61 per cent of production capacity (35,926 as against 58,750 metric tons). Most of the idle capacities appeared in 1986-1987, as many tungsten mines ceased operation either partially or totally, particularly in developed market economy countries. On the basis of figures published by the United States Bureau of Mines, the

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[6] Refer to "Pentagon recommends deep stockpile cutback", *American Metal Market*, 26 February 1992, page 1.

[7] Gerald R. Smith, *Tungsten Annual Report*, United States Department of the Interior, Bureau of Mines, October 1991, page 3.

[8] See Mineral Industry Survey, *Tungsten in December 1991*, the United States Bureau of Mines, 27 March 1992.

countries with the lowest rate of capacity utilization included Australia, Canada and the United States itself, countries which possess some of the largest tungsten reserves (annex VI). On the other hand, both Austria and Portugal, with limited ore reserves, have achieved a high rate of capacity utilization.

36. Unlike most of the developed market-economy countries, the closure of mines has affected less seriously developing countries (excluding China) where tungsten reserves are relatively small in size and operations are more labour-intensive. Among this set of countries, Brazil and the Republic of Korea are the most seriously affected, with their mine production currently amounting to, respectively, about 36 per cent and 25 per cent of capacity.

37. As regards China, it accounts for about half the world reserves. It also has the world largest production capacity. Owing to the countless difficulties faced by the tungsten industry in China, its development was seriously hampered before the current economic reform started. However, the 1980s saw a rapid expansion which increased production capacity to its current level estimated at 30,000 metric tons compared to 15,000 metric tons at the beginning of that decade. The 1980s also witnessed a concurrent expansion of processing plants in China for the processing of tungsten ores into up-market products. Recent developments have allowed China to catch up with other countries, with the level of development of its tungsten industry measured by the ratio of mine production capacity to ores reserves at about the world average.

38. Annex VII presents an up-dated list of mining projects, which shows little change from the situation last reported. With uncertain market prospects, low tungsten prices and a high level of over-capacity, tungsten mining is not considered as a high priority area for investment by mining companies. Most of the projects shown have been in abeyance or reported "under consideration" for such a long time that doubts arise as to whether they might ever come on stream.

Chapter II

RECENT PRICE DEVELOPMENTS IN THE TUNGSTEN MARKET

39. Price developments in the tungsten market have been strongly influenced by the recent low economic growth in major consuming countries. Other factors which have affected prices include the changing economic and political conditions in eastern Europe and increased government measures either in the form of anti-dumping duties or export controls or restraints. Although the economic slowdown has generally depressed prices across the market, the latter factors have resulted in quite substantial price differences for the same product between one market place and another. Lately, the news that the United States Department of Defence may recommend stockpile cutbacks has become an additional factor affecting the market.

A. Prices of tungsten ores and concentrates

40. Given the size of China as an exporter of ores and concentrates, its announcement in early 1991 to suspend exports of ores and concentrates had an immediate impact on the tungsten market. Despite the recent economic downturn in major consuming countries, tungsten prices did not collapse as expected in the face of accumulated stocks and falling market off-take. The Chinese measures resulted mainly in a reversal of the downward pressure, leading to firmer concentrate prices and a narrowing of the wide price differentials which had previously existed between the higher- and lower-grade wolframite.

41. However, the firmer prices were limited mostly to wolframite. It traded as low as $US 36 per m.t.u. towards the end of 1990 then rose gradually to reach between $US 50 and $US 57 per m.t.u. by the 1991 spring session of the Canton Fair. With a revival of business, as some consumers re-entered the market in the second quarter of 1991, wolframite prices were driven up with parcels trading between $US 54 and $US 60 per m.t.u. at the end of the quarter. The upward trends continued for most of the second half of the year, partly as a result of the 151 per cent anti-dumping duty imposed by the United States, which effectively closed access to Chinese material by the United States market, and partly due to the undertakings reached by China and the EEC on price matters regarding tungsten concentrates imported from China. Further increases saw wolframite being traded at between $US 59 and $US 67 per m.t.u. in the latter part of 1991, a price range which the tungsten market had not experienced since the price collapse of 1985-1986. On an average basis, the price of wolframite in 1991 increased by 22.6 per cent, largely neutralizing the decrease which had occurred in 1990.

42. The material entered 1992 at slightly lower prices varying within a range of between $US 57 and $US 66 per m.t.u. This setback may be explained by a number of factors, including the continued economic slowdown in major world economies, weaker market off-

take, increased quantities of material on offer and the fears of a possible relaxation of the Chinese ban on exports. In fact, the export suspension was effectively lifted following the announcement of the Chinese Government to re-establish quotations for tungsten concentrates as from February 1992.[9] However, the suspension of the export ban has not led to large-scale exports from China so far.

43. While wolframite prices could show substantial ups and downs at times, scheelite prices have remained relatively stable in recent years. In the meantime, the price differentials between wolframite and scheelite, which reached as much as $US 24 per m.t.u. between the high grades of the two materials, have been greatly reduced. In 1991, scheelite entered the market in the same price range where it had stayed (between $US 52 and $US 71 per m.t.u.) since the beginning of the last quarter of 1990. Scheelite prices had remained at that level for over the next half year until rising prices in the tungsten market also pushed up scheelite prices, although the increases affected principally its lower grades. For the higher grades, prices remained unchanged with top grades trading at $US 71 per m.t.u. By the end of the year, scheelite was traded in an even narrower price range of $US 55 to $US 71 per m.t.u., a range which overlapped with that of wolframite, while low-grade scheelite traded at prices below those of wolframite. Scheelite prices were to stay within this price range until the decision announced by *Metal Bulletin* in April 1992 to merge the scheelite quotation with the wolframite quotation to form a single quotation of tungsten concentrates.

44. The *Metal Bulletin's* decision to merge its separate quotations for wolframite and scheelite into a single quotation seems to be a logical development since spot trading conducted in western Europe has decreased sharply, particularly in scheelite. As the number of transactions reported for the formation of the quotation fell, it appeared more meaningful to form one single quote for tungsten concentrates rather than two separate ones, one for wolframite and one for scheelite. The new *Metal Bulletin* quotation was issued in April 1992 with a price range of between $US 56 and $US 66 per m.t.u. The range then stayed at this level until recently when prices began to slip, apparently in response to the news of DLA stockpile cutbacks. At the time of writing (June 1992), concentrates were being traded at between $US 55 and $US 64 per m.t.u.

B. Prices of intermediate tungsten products

45. While supply adjustments have resulted in a firmer market for tungsten ores and concentrates despite depressed market conditions, price conditions have evolved quite differently for intermediate products. Recent government measures in both consuming and

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[9] See International Business News of 5 February 1992 (Chinese edition)

producing countries regarding tungsten materials have considerably influenced prices. The result is that the same intermediate material does not command the same price in each market place. This development is amply illustrated in the case of ammonium paratungstate (APT) for which three price quotations now cover different market areas, mainly Hong Kong, United States and Western Europe. Between them very significant price divergences occur.

46. The restriction imposed by China on tungsten exports starting from the beginning of 1991 did not directly affect ammonium paratungstate. The effects have been mostly indirect to the extent that the suspension of concentrate exports leads to a strengthening of APT demand. In the United States, APT prices entered 1991 on firmer levels, which ranged between $US 59 and $US 65 per s.t.u. in the first quarter of the year, compared to between $US 58 and $US 60 per s.t.u. in the last quarter of 1990. The disappearance of cheap materials in the concentrate market and increased purchases for second and third quarters drove APT prices steadily up. They reached a range of between $US 76 and $US 78 per s.t.u. before the expiry of the Orderly Marketing Agreement (OMA) between China and United States. Lower than expected economic growth and the uncertainty created since the lapse of the OMA have led to weaker prices of ammonium paratungstate, which traded at between $US 66 and $US 68 per s.t.u. in the United States towards the end of 1991. The expiry of the OMA did not, however, lead to the United States market being inundated by cheap material; the APT market in the United States entered 1992 on a firmer note, with a price range of between $US 75 and $US 77 per s.t.u. The material traded at these price levels until quite recently when it was reported to be available at between $US 63 and $US 70 per s.t.u. (June 1992).

47. In Western Europe, imports of ammonium paratungstate have remained relatively free and the material has been subjected to more competitive conditions in the market which has generally benefitted from lower prices and relative price stability. APT prices ranged from between $US 57 to $US 60 per m.t.u. as the market entered 1991. Reactions to the firmer tungsten market led to some increases in APT prices well into the third quarter, when prices began to decline. Prices nevertheless remained firmer compared with the beginning of 1991, noteworthy for a material which had not been subjected to the same tariff barriers as ores and concentrates in the EEC countries. Like other tungsten markets, prices began to drift lower with the start of 1992. APT prices in Western Europe started the year with a price range of from $US 61 to $US 63 per m.t.u., which further weakened to $US 60 to $US 62 per m.t.u. by the end of the first quarter. The material was reported to be trading at between $US 59 and $US 61 per m.t.u. at the time of writing.

48. As regards ferro-tungsten, it was among the tungsten materials which had suffered most from the recent recession in industry. Largely used in the steel industry, it competes with molybdenum which is a substitute for tungsten as an additive for making tool steels. Ferro-tungsten prices entered 1991 on a firmer note, at $US 6.10 to $US 6.40 per kg,

compared with $US 5.95 to $US 6.20 per kg at the end of 1990. However, this material failed to benefit from the improved conditions in the other tungsten markets. Prices began to deteriorate in the face of weaker demand, which saw ferro-tungsten trading at lower and lower prices, to reach $US 5.50 and $US 5.70 per kg by the end of the third quarter of the year. Ferro-tungsten prices fell even lower as 1992 began, due not only to an excess of supply, including the offloading of stock material, but also because of the depressed consumption which has characterized the market of noble alloys including ferro-tungsten.[10] Since the beginning of 1992 to the time of writing, ferro-tungsten prices had slipped from $US5.40 to 5.50 per kg to between $US 5.10 to $US 5.25 per kg.

C. Tungsten prices in Hong Kong

49. New quotations have been introduced in Hong Kong since the middle of 1991 to cover mainly concentrates, ammonium paratungstate and ferro-tungsten. These quotations are references for the pricing of materials on offer in Hong Kong, which is a major market outlet for China, in an area which has recently experienced rapid industrial growth. The quotations become more and more useful as an increased volume of tungsten is traded through Hong Kong. The existing quotations, however, do not necessarily reflect fully the market conditions in the latter geographical area.

50. The Hong Kong APT quotation showed little variation over the period up to the end of 1991, with APT on offer at between $US 65 and $US 67 per m.t.u. when the quotations started and between $US 64 and $US 68 per m.t.u. as the year ended. The decreasing market off-take in a weak market has led recently to lower prices with the material being offered at between $US 60 and $US 64 per m.t.u. at the end of the first quarter of 1992. The quotation was further reduced in the second quarter, with APT being offered at between $US 56 and $US 60 per m.t.u.

51. As regards ferro-tungsten, the Hong Kong quotations for the material have reflected the current weakness in the ferro-tungsten market in the wake of a recession affecting the steel industry. The ferro-tungsten quotation in Hong Kong started in a range of between $US 5.70 and $US 5.90 per kg, which proved to be unsustainable in the prevailing market. By the end of 1991, the material was offered at between $US 5.60 and $US 5.70, and the latter quotation has remained unchanged.

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[10] See "Ferro-tungsten leads noble alloys decline," *Metal Bulletin*, 17 February 1992, page 10.

52. Although when the Hong Kong quotations started, APT was on offer at higher prices than in western Europe, the adjustments subsequently made reversed the situation, with APT available in Hong Kong at lower prices than in western Europe. As regards ferro-tungsten, the quotation has followed quite a different path. Ferro-tungsten was offered at lower prices than in western Europe at the start of the quotation. But the sharp fall in prices in the latter market made prices in Hong Kong look more expensive. These prices could, however, be substantially discounted when the terms of contracts were settled.

Chapter III

DEVELOPMENTS IN TUNGSTEN TRADE

53. Recent developments in tungsten trade have not only been influenced by economic factors but also by the significant structural changes affecting the tungsten industry. These changes include the vertical diversification of production in China, rising protectionism in consuming countries, and the changing trade relations between China and eastern Europe which are being transformed by the pursuit of more market-oriented policies replacing protocol-trade agreements. These changes have affected practically all aspects of tungsten trade, including its volume, composition, direction and pricing methods.

A. Developments in trade barriers

54. Trade barriers have seldom influenced tungsten trade more than in the past few years with the institution of anti-dumping duties by both the European Economic Community and the United States of America. A further increase in trade barriers cannot be excluded as some pressure groups have been working to extend protective measures.[11] In the recent environment of deteriorating trade conditions, such measures have been acutely felt by tungsten trade. It may be recalled that the United States imposed a 151 per cent anti-dumping duty on imports of Chinese ores and concentrates in October 1991. The same material was also subjected to anti-dumping duties in the EEC countries, with rates including a 37 per cent duty on tungsten ores supplied by CNIEC (China National Non-ferrous Metal Import and Export Corp.) and a 42.4 per cent duty on tungsten ores imported from other sources, including Minmetals (China National Metals and Minerals Import and Export Corporation). The EEC also instituted a duty of 33 per cent and 35 per cent respectively on Chinese tungsten carbide powder and tungstic acid-oxide, which were intended to be dissuasive rather than protective since China exported only limited amounts of those products to EEC countries.

55. Anti-dumping duties may have multiple effects on trade, including not only a negative impact on trade relations but also the trade distortion caused by such duties. Domestic consumers face higher prices for their tungsten materials than their overseas competitors who are still able to buy imported tungsten materials relatively free. Anti-dumping duties have always been a point of debate as regards their appropriateness to address problems in an industry. They are regarded by some as short-sighted solutions to long-term problems and the nemesis of free trade, but supported by others as part of a country's sovereign right

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[11] Peggy Abrahamsen, "RMA hits Chinese tungsten", *American Metal Market*, 8 April 1992, page 9.

to protect its industry.[12] It may be noted that the recent rise of protectionist measures has not been confined to tungsten trade alone, as there has been an increase of such measures world-wide. This rising protectionism has generally been detrimental to multilateral trade.

B. Trade in ores and concentrates

56. The availability of competitive intermediate materials since 1985 has made deep inroads into the market of ores and concentrates, seriously reducing the status of this material as the form in which most tungsten is traded internationally. In terms of both volume and value, trade in ores and concentrates has been falling rapidly behind that of intermediate materials, which include principally ammonium paratungstate, tungsten oxide, tungstic acid, sodium tungstate and ferro-tungsten. The recent economic slowdown, and the cutbacks in exports of ores and concentrates adopted by China have further accentuated this situation which saw a further fall in the trade volume of ores and concentrates in relation to that of intermediate materials. With the shrinking trade in ores and concentrates, many producers face the option of either going into processing to enter up-grade product markets or of closing down their mines permanently.

57. In 1991, total world imports of ores and concentrates fell for the second consecutive year, reaching an estimated total of 13,422 metric tons compared to 17,674 metric tons in 1990 and 23,617 metric tons in 1989. The origin of recent falls varied greatly from country to country. In the developed market-economy countries, total imports amounted to some 9,563 metric tons in 1991 compared to 10,043 metric tons in 1990 and 13,495 metric tons in 1989. The successive falls of imports have left very few significant importers of ores and concentrates. The only exception is the United States, a country which still manages to maintain a substantial plant capacity in operation for processing tungsten concentrates into intermediate products. Strong demand in some sectors of industry in the aftermath of the Gulf war coupled with speculative buying in anticipation of anti-dumping duties on Chinese imports led to a substantial increase of United States imports of ores and concentrates in 1991, which rose to 7,837 metric tons compared to 6,420 metric tons in 1990. The United States imports accounted for nearly 80 per cent of the total imports of developed market-economy countries, most of which have succumbed to the considerable advantages derived from the use of imported intermediate materials instead of ores and concentrates, particularly in countries which need tungsten to produce up-market products for export.

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[12] For opposing views on anti-dumping duties, it may be useful to refer for example to two recently published articles, namely by Andrew Lubin, 'Anti-dumping suits: Short-sighted solution to long term problem', *Metal Bulletin Monthly*, February 1992, pages 37-41; and by Paul C. Rosenthal, "GATT Chief puts Bush behind ball", *American Metal Market*, 31 March 1992, page 14.

58. In contrast to the United States, imports of ores and concentrates were down from 752 metric tons to 400 metric tons in Germany and from 1,553 metric tons to 700 metric tons in Japan, between 1990 and 1991. Imports also fell by 29.8 per cent to 250 metric tons in Austria and by 6.4 per cent to 250 metric tons in the Netherlands, but rose by 53.8 per cent to 260 metric tons in Sweden. In the latter country, the closure of the only domestic mine led to increased imports but it had adjusted itself like many other importing countries to the changing structure of the tungsten industry, relying more on imported intermediate materials for the supply of tungsten material needed by its industry.

59. In the developing countries, imports fell from 1,781 metric tons to 1,209 metric tons notwithstanding the increases in the Republic of Korea. In the latter country, imports rose to an estimate of 1,000 metric tons compared to 699 metric tons in 1990, and 500 metric tons in 1989. However, the decreases of entrepot trade, mainly of Hong Kong and Singapore, more than outweighed the increased imports of the Republic of Korea.

60. The fall of imports was also substantial in the countries of eastern Europe, down to 2,650 metric tons in 1991 compared to 5,850 metric tons in 1990. The falls of imports of ores and concentrates were due principally to an economic slowdown and the effects of the ongoing economic transition, rather than the substitution of imported intermediate materials for ores and concentrates, the consumption of which was still insignificant in these countries. The imports of the former USSR in 1991 were estimated at 2,000 metric tons, down from 5,000 metric tons in 1990 and 6,000 metric tons in 1989. The estimates for Bulgaria, Czechoslovakia and Hungary were also lower, while Poland reported no imports since 1989.

61. The weak market conditions and anti-dumping duties imposed by major importing countries, the large stocks of material in consuming countries in relation to demand and the stricter control exercised by China on its exports have resulted in sharp falls in export shipments since 1989. Total world exports were estimated at 12,702 metric tons in 1991, down from 16,874 metric tons in 1990 and 25,906 metric tons in 1989. The export cutbacks occurred mainly in China in line with the policies recently adopted by the Government. Shipments of ores and concentrates were subject to stricter export licenses following the ban on exports introduced at the beginning of 1991. Although this ban had been lifted in 1992, there had not been a flood of export shipments of Chinese ores and concentrates to the world market. Chinese exports were sharply down to 3,127 metric tons in 1991 compared to 10,272 metric tons in 1990 and 18,214 metric tons in 1989. On the basis of its exports for the first quarter of the year (42 metric tons), China's shipments would again fall sharply for 1992.

62. Shipment cutbacks by China and the anti-dumping duties imposed on Chinese exports saw increased exports by developing countries, particularly the Latin American countries. Bolivia, Brazil, Mexico and Peru all achieved higher exports in 1991. Total exports of ores and concentrates by Latin American countries rose to 2,500 metric tons compared to 1,987

metric tons in 1990. Export shipments from Thailand also rose from 249 metric tons to an estimated 400 metric tons. The changing market circumstances also benefitted exports from Portugal, where exports rose to 1,712 metric tons, compared to 1,319 metric tons in 1990. The bulk of Portuguese material was exported to the United States as consumption of ores and concentrates sank in the EEC. Meanwhile, export shipments from Australia suffered further setbacks with the closure of its King Island mine, and it exported only 727 metric tons of ores and concentrates in 1991 compared to 1,016 metric tons in the previous year.

63. With the sharp falls in volume, the total export value of ores and concentrates diminished tremendously despite improvements in market prices. The total value of world export of ores and concentrates was estimated at $US 82 million in 1991, compared with $US 96 million in 1990 and $US 171 million in 1989, shrinking the world market for these products to only a sixth of its size at the beginning of the 1980s.

C. Trade in intermediate products

64. With its large tungsten reserves, China aims in the longer term to be a supplier of intermediate and upper-market tungsten products rather than of ores and concentrates. Following the economic reform adopted by China, its tungsten industry moved into the export market supplying increasing quantities of intermediate materials, chiefly ammonium paratungstate, tungstic acid, tungsten oxides and hydroxides, and ferro-tungsten. When the decision came to cut back on export shipments at the beginning of 1991, it fell mostly on exports of ores and concentrates rather than on intermediate products. As a result, the latter materials have further enhanced their share in overall Chinese tungsten trade.

65. Total exports of intermediate materials from China are estimated to have been fairly stable, with shipments in 1991 equal to about the level of 1990, which was estimated at 11,000 metric tons compared to 13,000 metric tons in 1989 and 8,000 metric tons in 1988. Another major exporter of intermediate materials is the Republic of Korea which has made great efforts recently to develop a more integrated tungsten industry to meet demand in both its domestic and overseas markets. Its total exports in 1991 were about 1,400 metric tons, around the same level as the previous year. The shipments of the Republic of Korea have recently tended to move up-market, exporting higher value-added powder grade materials instead of intermediate materials.

66. The ammonium paratungstate market is now principally supplied by China. In 1991, China was reported to have exported some 8,000 metric tons, of which a total of 4,039 metric tons were exported to the EEC countries and 668 metric tons to the United States. The expiry of the Orderly Marketing Agreement (OMA) between China and the United States has not been so far followed by massive imports of Chinese material into the latter country. The rest of the Chinese APT was exported mainly to Japan.

67. As regards ferro-tungsten, the slowdown in the steel industry has considerably reduced the volume of trade in ferro-tungsten which originates mainly from China. In the EEC countries, imports from China were nil in both 1990 and 1991,[13] compared to 2,131 metric tons in 1989.[14] Another main destination of Chinese ferro-tungsten is Japan, which reported shipments of 557 metric tons and 626 metric tons for 1989 and 1990, respectively. No figure was yet available for 1991 at the time of writing. The Russian Federation has recently exported some ferro-tungsten according to reports but the tonnage may have come from stock material which stood in excess as a result of reduced consumption. The Russian Federation is not known to possess any significant capacity for producing ferro-tungsten. Most of its capacity in the ferro-alloy sector is concentrated in the ferro-manganese or ferro-chrome groups of material.

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[13] For the period January-June 1991

[14] See Huw Jones, "Soviet break-up puts producers under pressure", *Metal Bulletin Monthly*, March 1992, pp. 45-59.

Chapter IV

THE SHORT-TERM OUTLOOK IN THE TUNGSTEN MARKET

68. The picture which emerges from the foregoing analysis is that the tungsten market, like that of many other minerals and metals, has been seriously affected by the recent recession in industry. If the economic recession bottoms out, better market prospects may emerge for tungsten than has recently been the case. However, some caution is warranted about the strength of the anticipated recovery in the major world economies and its effects on tungsten demand. Recent signs are that the recovery in many countries is likely to be more modest than forecasts had predicted. Many of the tungsten-consuming industries, such as mining, construction and machine tools are still in the doldrums in many consuming countries. Therefore, demand is likely to stay weak in the short term although a recovery could be expected in the longer term.

69. Any demand up-turn in the wake of a recovery is likely to be accompanied by increases in trade volume rather than in tungsten prices. The larger volume of trade will continue to consist of intermediate materials rather than concentrates, given that the former materials are price competitive and cleaner to process from the point of view of consumers. On the assumption of continued relative price stability in the tungsten market, as experienced recently, the situation would benefit tungsten consumption as far as substitution and development of new applications in industry are concerned. However, prospects in this respect face an increased threat in the form of protectionist measures which have escalated in recent years, as has been the case with some other mineral and metal sectors. Pressure continues for increased protectionist measures which, if allowed, would further stifle a demand recovery.

70. On the supply side, the pressure of oversupply experienced by the market until recently has been relieved somewhat. Shipments have been substantially curtailed following measures adopted by China to reduce its exports, and stock materials overhanging the market have been reduced; this is particularly true of concentrates which are held by producers as 'involuntary' stocks, in some cases accumulated as far back as 1986. Furthermore, the re-opening of some mines recently, particularly in Latin American countries, has reduced the backlog of idle mine capacities, a situation which not only reduces the overhang effects of the latter, but also diminishes the likelihood of a rush to re-open closed-down mines as occurred for example during 1985-1986. Many of the remaining idle mines are relatively high-cost mines. Their viability would require a more substantial price improvement than the current level to enable them to operate profitably. Nevertheless, prospects are brighter for the market to strike a better balance following the oversupply of recent years.

71. However, the market situation remains precarious. The potential for market

disruption aggravating the oversupply situation still exists. Although shipments of concentrates have been curtailed, there is still a plentiful supply of intermediate materials at very competitive prices compared with concentrate prices. The current situation would suggest that a further strengthening of the market is dependent on supply adjustment of both concentrates and intermediate materials. The world export capacity of the latter materials has expanded sharply in recent years; prospects for a better balance between supply and demand would depend greatly on whether this capacity would sufficiently respond to adjustment needs for meeting emerging market conditions.

72. Developments in eastern Europe constitute an element of uncertainty in assessing the prospects of a better balance between supply and demand in the tungsten market. There has been a sharp fall of tungsten consumption in these countries since the substantial drop of production in their major tungsten-consuming industries including steel, coal, oil and gas metallurgy and armament. As a result of the rapidly decreasing absorption capacity for tungsten in eastern Europe, some fears exist that there may be a diversion of material on the world market. Whether these fears are founded is not easy to determine, as there are few statistics available with regard to production, consumption, trade and stocks in these countries. However, only limited amounts of material have so far been exported or re-exported by these countries.

73. The prospects in the tungsten market would also be greatly affected by any change in the United States stockpile policy leading to a substantial disposal of stockpile material. Current policy is reported to be under review following recent political developments in eastern Europe, which, it is argued, have greatly reduced the need for tungsten as a strategic material for military purposes compared for example with the 1960s. According to reports, the United States Department of Defence has recently proposed cutbacks over the next five years of nearly 10,000 metric tons in the tungsten stockpile, which is a large amount in terms of the current size of the export market for ores and concentrates. In the circumstances, the modality and timing of disposal of such an important quantity of tungsten ores and concentrates would be quite significant for the future stability of the market. At the time of writing, the above proposal had not been approved by the United States Congress.

74. Finally, prospects differ greatly among the producing countries as well as among the consuming countries. Producing countries which have continued to export their tungsten in the form of concentrates would be at a disadvantage in the event of improved demand conditions because of the dwindling market outlet for ores and concentrates as a result of the recent structural change in the tungsten industry which has seen an increased consumption of tungsten in the form of imported intermediate materials rather than in the form of concentrates. Likewise, in the consuming countries, improved demand would be unlikely to benefit equally all the plant capacities which have recently been shut down.

Annex I

Economic growth rates and forecasts in selected countries, 1983-1992 a

Country/region	1983	1984	1985	1986	1987	1988	1989	1990	1991	Forecast 1992
World economy	2.1	4.2	3.5	3.0	3.5	4.3	3.3	2.4	-0.3	1.4
Developed market-economy countries	2.4	4.5	3.4	2.7	3.4	4.2	3.5	2.4	0.8	1.8
Canada	3.2	6.3	4.8	3.3	4.0	4.4	3.0	0.8	0.1	
France	0.7	1.6	1.9	2.2	1.9	3.4	3.4	2.8	1.5	
Germany b/	1.5	3.0	2.0	2.4	1.7	3.6	4.3	4.5	1.2	
Italy	1.1	3.0	2.6	2.5	3.0	4.1	3.2	2.2	1.3	
Japan	3.2	5.1	4.6	2.5	4.2	5.7	4.8	5.6	4.5	
Sweden	2.5	3.0	2.5	1.7	2.8	2.5	2.1	0.9	-0.9	
United Kingdom	3.5	2.9	3.7	3.5	4.7	4.2	2.3	0.6	-2.2	
United States of America		3.5	6.5	3.8	2.8	3.7	4.4	3.0	2.3	-0.7
Developing countries	1.1	2.9	2.9	3.3	3.3	4.1	3.1	1.3	3.3	6.7
Brazil	-3.4	5.1	8.4	7.5	3.7	0.0	3.6	-4.0	-1.0	
India										
Republic of Korea	11.8	9.4	6.9	12.4	11.8	11.3	6.1	9.0	8.3	7.3
Mexico										
Thailand								10.0	7.5	8.0
China c/	7.1	7.9	12.3	7.4	9.4	11.0	4.0	5.2	7.0	7.8
Countries of Eastern Europe c/	4.2	3.5	3.2	4.3	2.6	4.0	1.8	-6.3	-16.6	-1.0
Ex-USSR	4.2	2.9	3.5	4.1	2.3	4.4	2.4	-4.0	-17.0	-17.0

Source: Trade and Development Report, UNCTAD, recent issues; Handbook of International Trade and Development Statistics, UNCTAD, recent issues; World Economic Survey, United Nations (New York), recent issues; World Economic Outlook, IMF, recent issues; Main Economic Indicators, OECD, recent issues; Economic Survey of Europe, 1990-1991, ECE.

a/ Rates refer to real gross domestic product or gross national product, unless otherwise specified.

b/ Not including East Germany. Figures for Germany prior to 3 October 1990 are indicated separately for the Federal Republic of Germany and the former German Democratic Republic.

c/ Net material product.

Annex II

Consumption of tungsten ores and concentrates, 1982-1992
(Metric tons of tungsten content)

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992 a/
World	39,950	39,902	47,415	44,968	42,456	43,513	46,228	48,996	42,183	37,365	
of which:											
Developed market-economy countries	12,640	13,711	20,149	17,112	13,636	14,373	15,969	15,265	11,298	10,535	
Austria	1,304	1,629	2,096	(2,000)	(2,000)	(2,000)	(2,100)	(1,800)	(1,800)	1,600	
Canada	-	-	-	-	6	765	386	300	290	200	
France	653	520	815	808	677	269	34	-	-	-	
Germany Fed. Rep. of	1,541	2,030	3,934	2,073	1,720	1,863	2,144	2,576	749	(400)	
Germany, (former) Dem. Rep.	300	300	300	300	300	300-	300	300	300	-	
Japan	1,880	1,994	2,302	2,616	2,145	2,119	1,980	1,538	1,440	(1,400)	
Netherlands	(300)	(300)	(300)	(400)	(350)	(300)	(330)	(350)	(200)	(200)	
Sweden	994	774	765	820	855	567	324	320	380	(160)	
United Kingdom	367	270	250	240	230	(100)	(50)	(50)	(50)	(50)	
United States	4,506	5,181	8,577	6,838	4,804	5,506	7,832	7,725	5,878	(6,400)	
Others	795	713	810	1,017	549	584	489	306	211	125	
Developing countries	2,698	2,318	2,872	3,453	2,956	3,196	2,559	2,931	2,585	2,630	
Brazil	454	450	538	1,048	672	867	753	(688)	(400)	(400)	
India	454	250	157	250	230	(250)	187	(200)	(200)	(200)	
Republic of Korea	1,742	1,555	2,070	2,048	1,987	1,950	1,580	2,000	(1950)	(2,000)	
Others	48	63	107	107	67	129	39	43	35	30	
Countries of Eastern Europe	(19,012)	(18,873)	(18,394)	(17,403)	18,064	17,444	(15,200)	(15,100)	(12,800)	(18,700)	
Socialist countries of Asia	(5,600)	(5,000)	(6,000)	(7,000)	(7,800)	(8,500)	(12,500)	(15,500)	(15,500)	(15,500)	

Source: UNCTAD secretariat, based on Quarterly Bulletin of Tungsten Statistics, Committee on Tungsten, various issues.
( ) Denotes estimates or apparent consumption.
a/ Provisional estimates.

Annex III

Consumption of concentrates and imported intermediate products in selected countries, 1985-1991 a/
(Metric tons of tungsten content)

	1985	1986	1987	1988	1989	1990	1991
Austria	2,295	2,237	2,447	3,402	3,569	4,112	2,109
Belgium-Luxembourg	-	-	152	553	997	210	710
France	1,193	995	1,387	1,694	1,917	955	647
Germany b/	3,046	2,505	2,558	3,723	4,465	2,665	1,827
Italy	102	163	138	158	175	169	198
Japan	3,716	3,305	3,987	4,654	5,162	4,782	4,280
Netherlands	-	-	-	1,334	765	1,337	1,436
Spain	20	34	62	117	73	76	90
Sweden	1,337	1,118	881	1,978	2,405	1,363	980
United Kingdom	781	650	c/	1,517	1,254	900	764
United States	8,794	6,774	7,179	9,766	9,087	8,248	9,000
Total (as above)	21,284	17,781	18,791	28,896	29,869	24,817	22,041

Source: Tungsten Statistics of the UNCTAD Committee on Tungsten.

a/ In a number of cases, the figures may suffer from some inaccuracy due to such factors as incomplete data or the lack of breakdowns. The data available on imported intermediate materials are usually expressed in gross weight. In order to derive their metal content, they are assumed to contain uniformly 85 per cent of metal by weight.

b/ East Germany not included.

c/ Not estimated, owing to incomplete data.

Annex IV

Production of tungsten ores and concentrates, 1982-1992
(Metric tons of tungsten content)

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992 a/
World	47,079	40,849	48,591	47,241	42,267	40,992	50,582	48,271	43,132	36,447	
of which:											
Developed market-economy countries	12,254	8,117	11,970	11,390	9,030	4,323	5,187	5,156	4,684	3,613	
Australia	2,588	2,061	1,733	1,970	1,572	1,152	1,261	(1,371)	1,087	238	
Austria	1,406	1,408	1,632	1,481	1,387	1,250	1,507	(1,500)	(1,500)	(1,400)	
Canada	2,938	328	3,715	3,005	1,273	-	-	-	-	-	
France	726	793	742	735	937	-	-	-	-	-	
Japan	804	474	477	568	570	259	266	286	254	270	
Portugal	1,359	1,182	1,509	1,766	1,657	1,209	1,381	1,376	1,404	(1,400)	
Spain	556	521	569	462	483	80	80	58	34	-	
Sweden	349	365	385	402	357	334	327	(80)	-		
United States of America	1,521	980	1,203	996	780	34	360	(450)	(400)	(300)	
Others	7	5	5	5	5	5	5	35	5	5	
Developing countries		9,645	8,452	9,071	8,301	6,687	5,545	5,265	4,098	4,984	
Bolivia	2,534	2,490	1,893	1,643	1,160	624	924	1,118	(818)	1,200	
Brazil	1,365	1,026	1,101	1,297	875	672	739	(790)	(420)	400	
Korea, Republic of	2,539	2,101	2,702	2,370	2,240	2,180	1,825	1,560	1,250	800	500
Mexico	78	147	145	282	294	213	206	170	183	194	
Myanmar, Union of	844	930	1,096	945	715	493	450	464	450	400	
Peru	654	703	786	732	604	440	545	265	389	(1,000)	
Rwanda	322	231	291	167	13	11	3	110	156	200	
Thailand	856	563	742	585	512	702	651	648	290	650	
Other	453	261	315	280	274	284	202	150	142	140	
Countries of Eastern Europe	(9,480)	(9,780)	(10,050)	(10,050)	(9,050)	(9,050)	(7,050)	(7,050)	(7,050)	(6,050)	
Socialist countries of Asia	(15,700)	(14,500)	(17,500)	(17,500)	(17,500)	(22,000)	(32,800)	(30,800)	(27,300)	(21,800)	

Source: UNCTAD secretariat, Quarterly Bulletin of Tungsten Statistics, Committee on Tungsten, various issues.

a/ Provisional estimates.

( ) Denotes estimates.

Annex V

Movements of tungsten stocks by type in selected countries, 1981-1990
(Metric tons of tungsten content)

	End of year									
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
A. Ores and concentrates										
Producers' stocks										
Australia	507	385	306	379	481	435	416	(705)	(717)	447
Bolivia	...	...	...	...	...	...	105	130	(210)	(200)
Brazil	-	17	17	17	875	...	70	(84)	(100)	-
France	139	159	76	85	205	65	-	-	-	-
India	21	11	32	54	50	50	57	10	11	15
Japan	211	32	39	27	26	21	41	72	75	(80)
Mexico	7	12	18	20	95	8	19	13	25	(34)
Peru	...	...	...	46	241	...	71	(54)	(70)	
Portugal	380	370	251	305	1,042	941	970	1,057	1,180	1,150
Republic of Korea	338	76	231	200	44	45	(45)	-	-	-
Rwanda	30	40	48	...	(60)	10	10	10	22	20
Spain	...	75	114	84	50	62	47	45	20	
Sweden	-	-	-	-	-	-	-	206	-	-
Thailand	793	834	804	1,029	1,025	1,100	1,295	1,487	1,553	1,700
Turkey	23	116	96	80	145	43	20	-	-	-
United Kingdom	73	-	-	-	-	-	-	-	-	-
United States of America	54	54	46	60	21	21	21	10	7	(20)
Sub-total	2,576	2,181	2,078	2,386	4,360	2,801	3,187	3,883	3,990	3,666
Consumers' stocks										
Argentina	9	-	-	-	-	-	-	-	-	-
Canada	...	...	...	...	...	255	75	70	61	(60)
France	9	47	177	130	221	-	-	-	-	-
Japan	409	511	557	671	687	448	455	561	860	(750)
Portugal	3	5	3	10	1	-	1	1	1	(1)
Sweden	-	-	256	302	333	353	301	218	40	(80)
United States	1,765	1,085	959	1,077	502	329	499	1,261	1,077	1,778
Sub-total	2,195	1,648	1,952	2,190	1,744	1,385	1,331	2,111	2,039	2,669
Dealers' stocks										
Argentina	23	11	9	9	-	-	-	-	-	-
Japan	-	11	-	1	-	-	-	-	-	-
Peru	...	...	...	...	...	...	7	7	27	1
Thailand	530	462	339	113	116	120	51	107	83	(83)
Sub-total	553	484	348	123	116	120	58	114	110	84
Total (as shown above)	5,324	4,313	4,378	4,699	6,220	4,306	4,576	6,108	6,139	6,419
B. Ammonium paratungstate										
USA a/	748	870	1,191	1,056	477	292	911	915	896	578

Source: UNCTAD, Quarterly Bulletin of Tungsten Statistics, Committee on Tungsten, various issues and the Bureau of Mines, the United States Department of the Interior.

a/ Consumers' and producers' stocks only.
- Denotes negligible or nil.
... Denotes not available.
( ) Denotes provisional estimates.

Annex VI

Ratios of mine capacities to ore reserves by country

(1) Country	(2) Production capacities (metric tons metal content)	(3) Ore reserves (metric tons metal output)	(4) Ratios [(2) (3)]
Australia	3 300	56 000	0.059
Austria	1 600	10 000	0.160
Bolibia	1 300	58 000	0.022
Brazil	1 100	20 000	0.055
Myanmar, Union of	500	20 000	0.025
Canada	3 000	260 000	0.115
China	30 000	1 050 000	0.028
France	900	20 000	0.045
Rep. of Korea	2 000	58 000	0.034
Portugal	1 400	26 000	0.054
Thailand	750	30 000	0.025
USA	3 700	150 000	0.025
USSR (Ex.)	9 200	280 000	0.033
Total	58 750	2 038 000	0.029

Source: UNCTAD, based mainly on figures of production capacities and ore reserves published by the United States Bureau of Mines.

Annex VII

An updated list of new tungsten mining projects

Location	Project	Company(ies)	Capacity in tons W	Completion date	Remarks
Australia	Burnie (Tasmania)	Taminex/McIntyre	-	-	Project awaiting decision
Bolivia	Chicote Grande	Anschutz Mining	1 000 a/	-	Project was due for completion in 1984-1985 but was halted.
Brazil	Carajas	Docegeo (CVRD subsidiary)	100	-	Development under consideration.
Canada (Northwest Territories)	Mactung	Amax	1 000-3 500	-	Originally commissioned for 1985 but postponed to 1987 and then further postponed; development awaiting significant improvement in market conditions.
France (Belfort)	Auxelles	Elf-Aquitaine/ Cominco	500	-	Deferred (originally due for completion in 1984).
India	Degana Rajasthan	Rajasthan Tungsten	200 b/	-	Project at proposal stage in 1988 but no further progress has since been reported; ore grade reported 0.3 per cent Wo_3
	Almora	Uttar Pradesh Development Corp.	-	-	Reserves estimated at 10 m metric tons with an ore grade of 0.4 per cent tungsten content; a pilot plant was reported to have been established in 1989 with commercial working to start within four to five years.
Peru	Altiplano	Minera Regina S.A.	680 b/	1988-1989	Expansion project (production of concentrates to increase to 2,700 metric tons per year); the completion date may have been extended. (Part of this project may have come on-stream recently).
South Africa (Cape Province)	Upington	Shell	600 a/	-	Completion date originally fixed for 1984 following a full-scale feasibility study after discovery of deposits in 1982; but project has been held in abeyance.
Spain (Salamanca)	Los Santos	Banco Bilbao/ Billiton BV	500 c/	-	High-grade deposits discovered in 1983 with reserves estimated at 1 m tons of ores grading 28 kg W per ton, enough for 10 and 13 years' exploitation; developments awaiting improved market conditions.
(Almomarin)	La Parrilla	Banco Español de Credito y Banco Credito Industrial	1 500 000d/	-	Estimated resources 32 million metric tons containing 45,000 mt of WO_3; initial investment estimated at 1582 m pesetas to a maximum of 3082 m pesetas; opening under study.
Thailand	Doi Mek	Thai-Swedish Mining	340	-	Expansion (under consideration).
United Kingdom	Hemerdon (Devon)	Amax/Hemerdon Mining and Smelting	2 200	-	Planning permission was granted at the end of 1985 but development has been postponed.

Source: UNCTAD secretariat, based on annex VIII of TD/B/C.1/TUNGSTEN/84 as revised, and information provided by direct contacts and a number of periodicals, including Mining Magazine and Engineering and Mining Journal, recent issues.

Note: The information provided in the list may not be complete; Committee members are invited to provide additional information which may be available to them for updating or completing this table.

a/ Estimates by the UNCTAD secretariat. b/ Capacity refers to tons of ore per day. c/ Maximum estimate. d/ Capacity refers to tons of ore per year. - Denotes data not available.

Annex VIII

World exports and imports of tungsten ores and concentrates
1984-1991

(metric tons of tungsten content)

	1984	1985	1986	1987	1988	1989	1990	1991
A. World Exports	26 621	27 092	23 892	22 957	24 210	26 382	17 198	11 777
Developed market-economy countries	8 264	7 893	4 833	3 137	3 758	2 978	2 707	2 400
Developed countries	7 145	6 747	5 394	6 415	4 098	5 190	4 219	4 450
Socialist countries of Asia	11 212	12 452	13 665	13 405	16 354	18 214	10 272	4 927
B. World Imports	26 931	25 136	20 899	19 889	23 614	24 617	18 551	14 679
Developed market-economy countries	16 120	13 053	8 937	9 794	13 997	13 495	10 072	9 849
Developing countries	1 467	3 230	2 948	1 651	1 393	2 922	2 479	1 830
Countries of eastern Europe	9 344	8 853	9 014	8 444	8 224	8 200	6 000	3 000
C. Statistical balance (A-B)	-310	+1 956	+2 993	+3 068	+596	+1 765	-1 353	-2 902

Source: UNCTAD secretariat, on the basis of Tungsten Statistics of the Committee on Tungsten.